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Home

About

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Navy Medicine News

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## Navy Medicine Partners With FBI, Explores Craniofacial Reconstruction

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*By Capt. Gerald Grant, director of the Craniofacial Imaging Research Group, Naval Postgraduate Dental School, directorate of Navy Medicine Manpower Personnel Training and Education Command and service chief of 3-D Medical Application Center, Bethesda, Md.*



My team and I are currently involved in some unique craniofacial reconstruction projects and we're partnering with the FBI to do it. We are developing a process where digital images of the skull and the complete head are captured during dental in-processing of service member recruits.

The process will provide a digital template for craniofacial reconstruction to be used if necessary in the event of combat trauma. I have found that the use of digital 3-D images to produce cranial implants for our wounded warriors has reduced the fabrication and surgical time by more than half. By taking images at the time of entry into service, we are able to use the original images of personnel to improve our reconstructions, minimize operating room (OR) time, and create better outcomes.

Images are computed from CT scans, MRIs, Cone Beam CT scans and a host of other data sources. We take those images and produce a "virtual 3-D model," which we can register with other models, remove parts and develop a surgical plan. This is cutting edge medical/dental research. The data we capture involves both skeletal and surface capture of the head and presently there are only a few small databases with that type of information. Our database will potentially be the largest and most diverse database of craniofacial images in the world which is why we have attracted the attention of have other organizations including the FBI for partnership on the project.

The FBI needs a way to identify thousands of human skeletal remains that they have throughout the United States. As such, they have developed a couple of protocols where a craniofacial database would be of great use.

I am currently working on an identification program called ReFace for them. I have a limited number of Head CT scan images that represent Caucasian, black, and Asian men and women. We can place a CT scan of a skull into the program and it will do a reconstruction of the face from the data it contains. I have developed an objective measure to validate their software so we can see how accurate it is and I am continuing to work with the FBI and software

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March 2015 (5)

February 2015 (16)

January 2015 (12)

December 2014 (17)

developers to increase the accuracy and add more data.

This data can be used to develop a system where we can reconstruct cranial defects for fabrication as well. It is pretty cool when all the data looks back at you in the form of a face and that's where the FBI wants to identify the face and link it to a real person.

Although the FBI studies are more directed toward forensic identification, the software works to provide reconstruction information as well, which is more in tune with what we want to study for the Navy. Either way, by leveraging the skills and resources of both of our organizations, we are developing a process that will benefit multiple parties, especially our wounded warriors who have sacrificed so much already. I am proud to be a part of this program and look forward to continue my work on this critical project.

← Next post

Previous post →

November 2014 (11)

October 2014 (15)

September 2014 (20)

August 2014 (14)

July 2014 (13)

June 2014 (8)

May 2014 (11)

April 2014 (9)

March 2014 (14)

February 2014 (7)

January 2014 (7)

December 2013 (7)

November 2013 (12)

October 2013 (7)

September 2013 (14)

August 2013 (13)

July 2013 (11)

June 2013 (22)

May 2013 (15)

April 2013 (14)

March 2013 (14)

February 2013 (14)

January 2013 (12)

December 2012 (11)

November 2012 (11)

October 2012 (7)

September 2012 (9)

August 2012 (12)

July 2012 (13)

June 2012 (17)

May 2012 (22)

April 2012 (14)

March 2012 (13)

February 2012 (14)

January 2012 (13)

December 2011 (13)

November 2011 (20)

October 2011 (22)

September 2011 (12)